**Coronary Artery Disease**

**Introduction:**

Coronary arteries supply the heart with oxygenated blood. The four primary coronary arteries are located on the surface of the heart:

* Right main coronary artery
* Left main coronary artery.
* Left circumflex artery.
* Left anterior descending artery.

**Coronary artery disease (CAD)** is the term applied to obstruction of blood flow through the coronary arteries to the heart muscle cells, typically from atherosclerosis. Blood flow reduction resulting from CAD can cause angina and progress to myocardial infraction or sudden death if blood flow is not restored.

CAD is characterized by the accumulation of plaque within the layers of the coronary arteries. The plaque progressively enlarges, thicken, and calcify, causing a critical narrowing (>70% occlusion) of the coronary artery lumen, resulting in a decrease in coronary blood flow and an inadequate supply of oxygen to the heart muscle.

**Terms to describe the disease process:**

* Atherosclerosis
* Angina pectoris
* Myocardial infraction

Atherosclerosis:

Atherosclerosis is thickening or hardening of the arteries caused by a buildup plaque in the inner lining of an artery.

Angina Pectoris:

Angina pectoris is a clinical syndrome usually characterized by episodes of pain or pressure in the anterior chest which is usually caused by insufficient blood flow to the heart muscle.

Myocardial Infraction:

Myocardial Infraction (MI), commonly known as a heart attack that occurs when the blood flow decreases or stop to the coronary artery of the heart, causing damage to the heart muscle.

**Etiology of Coronary Artery Disease:**

Atherosclerosis is the major cause of coronary artery disease. Many risk factors have primarily been associated with CAD are:

Non-modifiable risk factors:

1. Age:

* After age of 45 years in men and after age of 55 in women because of decrease in elasticity of arteries with aging.

1. Gender:

* Men develop CAD at earlier age than women. Estrogen in females lowers serum cholesterol.

1. Hereditary:

* First degree relative with cardiovascular disease at 55 years of age or younger for men and at 65 years or younger for women.

1. Race:

* African Americans have higher incidence of CAD or heart disease than in Caucasians.

Modifiable risk factors:

1. Diabetes:

* Incidence of CAD is two-three times more in diabetes. This may be due to elevated levels of circulating insulin helps to form atheroma and damaged arterial intima and insulin also modifies lipid metabolisms.

1. Hypertension:

* Hypertension affects the ability of blood vessels to constrict or dilate. Decreased elasticity of blood vessels, tearing effect on arteries, and increased resistance of ejection of ventricular volume may lead to CAD.

1. Smoking:

* Causes vasoconstriction and increases myocardial oxygen demand.
* In response to nicotine catecholamine is increased which increases heart rate and blood pressure.

1. Excessive alcohol use:

* Rises blood pressure leading to heart failure.
* Increases triglycerides.
* Causes irregular heartbeats.

1. Hyperlipidemia:

* Level above 240 mg/dL increases the risk of developing CAD.

1. Obesity:

* Increases heart workload and risk of hypertension, diabetes, hyperlipidemia.

**Pathophysiology of Coronary Artery Disease:**

|  |
| --- |
| Risk factors |

|  |
| --- |
| Accumulation of lipids |

|  |
| --- |
| Inflammatory process causing narrowing of lumen and decreased in blood flow |

|  |
| --- |
| Fiber tissue formation or formation of thrombus |

|  |
| --- |
| Occlusion of blood vessels causing obstruction in blood flow |

|  |
| --- |
| Decreased blood supply to myocardium causing ischemia |

|  |
| --- |
| Necrosis of myocardial muscles |

|  |
| --- |
| Coronary artery disease |

**Clinical manifestation of coronary artery disease:**

* Chest pain or discomfort
* Weakness
* Light headache, Dizziness
* Cold sweat
* Shortness of breath
* Palpitations
* Nausea and vomiting
* Fatigue and sleep problem
* Tightness in arms, back, back of neck or jaw

**Diagnostic investigation in coronary artery disease:**

* Diagnostic investigation
* History taking
* Physical examination
* ECG (Electrocardiogram)
* Echocardiogram
* Stress test (Treadmill test)
* Blood test (Cardiac marker, Lipid profile)
* Imaginary investigation: Chest x-ray, CT scan
* Coronary angiography

**Management of coronary artery disease:**

1. **Emergency Management:**

* Use rapid transit to the hospital.
* High flow oxygen
* Early CPR with emphasis on chest compression
* Effective advanced life support
* IV analgesia and antiemetics
* Obtain other diagnostic to clarify the diagnosis.
* Provide thrombolytic therapy.

1. **Pharmacotherapy:**

Various drugs can used to treat coronary artery disease including.

* vasodilator (this drug acts as blood vessel dilator) e.g. Nitrates.
* Beta-Adrenergic Blockers (decrease workload in heart) e.g. Propranolol, Metoprolol
* ACE inhibitors (Captopril, Enalapril)
* Cholesterol lowering drugs (Atorvastatin)
* Calcium channel blockers (the improve coronary blood flow) e.g. Amlodipine, Verapamil, Diltiazem
* Antiplatelets and anti-coagulants agents (Aspirin, Clopidogrel)
* Morphine Sulphate for analgesic,
* Folic acid and Vitamin B complex to reduce homocysteine level.

1. **Lifestyle changes:**

Although CAD is a major disease, the measures, or steps to be taken to prevent it are quite simple.

* Quit smoking.
* Reduce alcohol consumption.
* Regular exercise
* Healthy diet which is low in fat and sodium
* Maintaining healthy weight

1. **Surgical Management:**
2. **Coronary Artery Bypass Surgery**

* Coronary artery bypass grafting is a procedure to improve poor blood flow to the heart.
* It creates a new path for blood to flow around a blocked or partially blocked artery in the heart.
* The surgery involves taking a healthy blood vessel from the chest or leg area.
* The vessel is connected below the blocked heart artery.
* The new pathway improves blood flow to the heart muscle.

1. **Percutaneous Coronary Intervention (PCI)**
2. Percutaneous transluminal coronary angioplasty:

* It is a technique in which a balloon-tipped catheter is inserted into the femoral artery (although brachial and radial can be used) and threaded under x-ray guidance into a blocked artery.
* The balloon is inflated several times to reshape the lumen by stretching it and deflated to stretch the vessel wall and flatten the plaque.
* This procedure is performed in catheterization laboratory (Cath lab).

1. Intracoronary stent:

* A diamond mesh tubular device is placed in the coronary vessel.
* It prevents restenosis by providing support.

1. Intracoronary atherectomy:

* Atherectomy is a catheter-based procedure used to remove plaque buildup in the arteries.
* It is recommended if the plaque is very hard, or a blockage still exits after angioplasty and stenting.

1. **Nursing Management:**

Nursing Assessment:

* Assess the risk factors for CAD.
* Assess severity of pain.
* Assess vital signs.
* Assess patients and family level of anxiety.
* Assess patients’ family understanding about disease condition.

Nursing Diagnosis:

* Impaired gas exchange related to decreased blood flow as evidenced by breathlessness.
* Acute pain related to disease condition as evidenced by patient’s verbalization.
* Impaired physical mobility related to weakness as evidenced by unable to perform daily activity.
* Imbalanced nutrition less than body requirement related to less intake of food.
* Decreased cardiac output related altered heart rate and rhythm.

Nursing Intervention:

* Position patient in comfortable position (Fowler’s position promotes ventilation).
* Monitor vital signs (e.g. heart rate, blood pressure) Cardiac rhythm and pulse oximetry or arterial blood gas analysis. Take vital signs every 5 to 10 mins until angina pain subsides.
* Administer oxygen if needed.
* Obtain a 12- lead ECG and administer anti-anginal drug as prescribed.
* Provide for adequate rest periods and assist with perform self-care activities as indicated.
* Stress the importance of avoiding straining/ bearing down, especially during defecation.
* Assess for signs and symptoms of heart failure.
* Stay with patient experiencing pain or appears anxious. Teach relaxation techniques.
* Evaluate mental status, noting development of confusion, disorientation.
* Instruct client regarding low-calorie, low sodium, low cholesterol, low-fat diet with an increase in dietary fiber.
* Stress that dietary changes should be incorporated for the rest of the life.
* Instruct regarding prescribed medications.

**Teach patient about Physical activity:**

* Aerobic activity of moderate intensity for minimum of 30-40 mins 4 or 5 times a week e.g. brisk walking and swimming.
* All exercises session should begin with 5 minutes warm up and end with a 5-10minute cool down of low intensity exercise.
* Exercise for older adult with CAD can improve cardiac functional capacity, reduced ischemic episode, decreased the risk of complications, and promote the sense of well-being and control over the condition.

**Complications of coronary artery disease:**

* Chest pain
* Heart attack
* Heart failure
* Arrhythmia

**Prevention of coronary artery disease:**

* Eat healthy.
* Be more physically active.
* Keep to a healthy weight.
* Give up smoking.
* Reduce alcohol consumption.
* Keep blood pressure under control.
* Maintain sugar level.